PROC. ENTOMOL. SOC. WASH.
108(1), 2006, pp. 131–138

ADULT CADDISFLY (TRICHOPTERA) PHENOLOGY AT THE HANFORD REACH NATIONAL MONUMENT, WASHINGTON STATE

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Abstract.—Adult caddisflies were sampled on the Wahluke Wildlife Area and Saddle Mountain National Wildlife Refuge subunits of the newly created (2000) Hanford Reach National Monument using 15-watt "black lights" from April 2002 through April 2003. A diverse fauna consisting of nine families, 21 genera, and 33 species were collected. *Protoptila coloma* Ross, *Agraylea multipunctata* Curtis, *Hydroptila xera* Ross, *Ceraclea alagma* (Ross), *Nectopsyche lahontanensis* Haddock, *Oecetis cinerascens* (Hagen), and *Ylodes reuteri* (MacLachlan) represent new records for Washington State. Species composition and phenology are presented in tabular form.

Key Words: Trichoptera, Hanford, survey, Washington State, caddisflies

During the period April 2002 through April 2003, entomological survey studies were conducted on the Hanford Reach National Monument located in south central Washington State. The Monument was created in 2000 from portions of the Hanford Nuclear Site and is administered by the United States Fish and Wildlife Service and the United States Department of Energy. The Monument includes a variety of subunits but those surveyed for this study were the Wahluke Wildlife Area and the Saddle Mountain National Wildlife Refuge that are located in portions of Franklin, Grant, and Adams counties that lie to the north of the Columbia River (Fig. 1).

Newell et al. (2001) conducted a survey of caddisflies at the two largest spring-stream systems on the Monument—Rattlesnake and Snively Springs. These springs are found in the Fitzner-Eberhardt Arid Lands Ecology Reserve subunit of the Monument, and are situated approximately 20 km from where our studies were conducted. Newell et al. (2001) found a total of 26 taxa based on adults but noted that previous benthic studies (Gaines 1987a, b; Gaines et al. 1989, 1992; Newell 1998) had revealed only four genera of caddisflies based on larval collections from the springs. Newell et al. (2001) postulated that most of the caddisflies they obtained during their survey work did not originate from the spring systems, but from the nearby Columbia River. Because of habitat differences found on the Wahluke and Saddle Moutain subunits and their closer proximity to the Columbia River, we decided to undertake a more inclusive study of the Monument in order to verify and add possible new records, as well as verify and add to available phenological data.

Site Description

Climate at Hanford is best characterized as semi-arid with hot and dry summers and

Fig. 1. Subunits of the Hanford Reach National Monument. Sampling during this study took place in the Wahluke and Saddle Mountain subunits.

cold winters. Precipitation ranges from 30–35 cm at the crest of Rattlesnake Ridge to less than 12 cm along the Columbia River. Temperatures range from an average of 3°C in January to 33°C in July; temperatures of 32°C or above occur an average of 56 days per year (ERDA 1975).

The Wahluke and Saddle Mountain subunits of the Hanford Reach National Monument are bordered on the south by one of the few free-flowing stretches of the Columbia River. The units primarily consist of sandy soils supporting native shrub-steppe plant communities consisting mainly of shrubs including sagebrushes and rabbitbrushes, Sandberg's bluegrass (*Poa sandbergii* Vasey), perennial bunchgrasses, and a variety of forbs; invasive cheatgrass (*Bromus tectorum* L.) also is common in disturbed areas. Details of the flora are found in Sackschewsky et al. (1992). Aspects of both the flora and fauna are treated in Downs et al. (1993). The Wahluke and Saddle Mountain subunits contain numerous

lakes and wetlands created and sustained by raised water tables associated with major irrigation canal return systems referred to as the Saddle Mountain Wasteway and WB-10 Wasteway. This wastewater return provides the only source of water on the sites besides the Columbia River. This wastewater return provides for a series of lakes and shallow pools that are interconnected by numerous canals. The system prevents wastewater from empyting into the Columbia River. Irrigation return flow quality is discussed by Johnson and Prescott (1981).

Numerous collection sites were established and maintained throughout the Wahluke and Saddle Mountain subunits from 11 April 2002 through 15 April 2003. Sites were established at various locations including within 100 m of the Columbia River, in the riparian areas surrounding one of the larger lakes (700 acres), next to several of the shallow irrigation runoff ponds, along several of the canals, and at a variety of areas throughout the shrub-steppe habitat. These latter collecting sites were established at distances of less than 5 m to no more than 1 km from a source of water. Specific sites were trapped on an irregular basis but, at least three different sites were trapped on a weekly basis. Collecting was not conducted in January or February. Collection information from specific trapping sites was maintained but, as we did not find specific trends in caddisfly species per site, these data are not included in this paper.

Materials and Methods

Adult caddisflies primarily were collected through the use of 15-watt "black light" traps that were established for both caddisfly and moth collections. Black light traps consisted of six gallon plastic buckets over which a metal funnel was placed. A 15-watt, fluorescent tube was placed vertically over the funnel. In some cases, the bulb was surrounded by a series of four vanes while in other traps, a bulb was simply hung over the funnel. We did not monitor for differences in capture rates between the two types of traps, but no evident differences were noted. Ethyl acetate was used as a killing agent in the traps. Traps were usually established within an hour of sundown and collected within an hour of sunrise. Running times for traps depended on the date of collection (i.e., shorter in the spring and longer in the summer and fall).

Trap contents were collected each morning and placed into containers for return to the laboratory. Caddisflies were sorted under a microscope at the laboratory. If the number of caddisflies in a trap was less than 200 and appeared to consist of at least three taxa, all of the specimens were retained and identified. If the number of specimens in the trap was greater than 200, specimens were sorted into morphologically similar units and up to 50 specimens of each were retained; the remainder were discarded. In several instances, over 3,000 caddisflies were found in a single trap.

Relative abundance figures (Table 1) are subjective and are based on the number of specimens of a taxon collected during a given night and during the season. If a species was collected on only one date during the year or if less than 10 total specimens were collected, it is listed as rare (R) in the table. If a species was collected on at least two separate dates or between 11 and 50 were taken in total, it is listed as occasional (O). If a species was collected on at least two separate dates or between 51 and 200 were collected, it is listed as common (C). If a species was collected on at least two separate dates or more than 201 specimens were collected, the species is listed as abundant (A). All specimens were identified by DER, and voucher material is housed in the James Entomological Collection, Washington State University.

Results and Discussion

Table 1 lists the 40 taxa that were collected during this study; 33 of which were identified to species; specimens of *Leucotrichia* were only identified to the generic level. Other taxa listed at the generic level

Table 1. Caddisflies collected on the Wahluke and Saddle Mountain subunits of the Hanford Reach National Monument. RA = Relative abundance: R = rare; O = occasional; C = common; A = abundant (see text). Months divided into two-week units—April 2002 through April 2003. No caddisflies were collected between November and March.

Taxon	RA	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
GLOSSOSOMATIDAE										
Culoptila cantha (Ross)	R						●	●		
Culoptila sp.					●		●			
Glossoma velonum Ross	A		⊙		●	⊙		⊙	⊙	⊙
Protopila columa Ross	O					●	●	●		
Protopila erotica Ross	R					●	●	⊙		
HYDROPSYCHIDAE										
Ceratopsyche cockerelli Banks	A			●	●	●	●	●	●	●
Cheumatopsyche analis (Banks)	C				●	●	●	●	●	●
Chaumatopsyche campyla Ross	A				●	●	●	●	●	●
Cheumatopyche sp.				●	●					
Hydropsyche californica Banks	A			⊙	⊙		●	●	●	●
Hydropsyche occidentalis Banks	R						●			
HYDROPTILIDAE										
Agraylea multipunctata Curtis	O				●	●	●	⊙		
Hydroptila ajax Ross	R					●	●	⊙		
Hydroptila arctia Ross	O							●	●	●
Hydroptila argosa Ross	A				●	●	●	●	●	●
Hydroptila xera Ross	R			⊙		●		●	●	
Hydroptila sp.				●	●		●			
Leucotrichia sp.							⊙			
Stactobiella delira (Ross)	R						●			
LEPIDOSTOMATIDAE										
Lepidostoma cinereum (Banks)	R							●	●	
Lepidostoma sp.			●		●					
LEPTOCERIDAE										
Ceraclea alagma (Ross)	R					●				
Mystacides alafimbriata Hill-Griffin	R						●		●	
Nectopsyche lahontanesis Haddock	R							●		
Nectopsyche sp.					●		●	●		
Oecetis avara (Banks)	R						●	●		

Table 1. Continued.

Taxon	RA	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Oecetis cinerascens (Hagen)	C				●	●	●			
Oecetis imobilis (Hagen)	A				●	●	●	●		
Oecetis inconspicua (Walker)	A				●	●	●	●		
Triaenodes tardus Milne	C				●	●	●	●		
Ylodes frontalis (Banks)	R						●	●		
Ylodes reuteri (MacLachlan)	O			●	●				●	
LIMNEPHILIDAE										
Limnephilus acula Ross & Merkley	R						●			
Limnephilus assimilis (Banks)	C							●	●	●
Limnephilus spinatus Banks	O		●				●			
PHRYGANEIDAE										
Phryganea cinerea Walker	R				●	●				
POLYCENTROPIDAE										
Polycentropus cinereus (Hagen)	R						●	●		
Polycentropus flavus (Banks)	R				●					
Polycentropus sp.				●	●					
PSYCHOMYIIDAE										
Psychomyia flavida Hagen	A				●	●	●	●	●	

in Table 1 may or may not represent the listed species but for various reasons (e.g., females only or damaged specimens) could not be identified to species. This study represents a single year of collecting and, should further surveys be conducted, some of these questions may be answered and further species may be added to the richness of the Wahluke and Saddle Mountain subunits of the Monument.

In a comparison to the study conducted of the Snively and Rattlesnake Springs systems on the Fitzner-Eberhardt Arid Lands Ecology Reserve subunit of the Monument (Newell et al. 2001), we found a surprisingly different fauna. Sixteen species were common to both studies; eight species were collected only by Newell et al. (2001), while 17 are unique to this study (Table 2). As both studies only involved the collection of adults, it is difficult to assign larval habitat preferences to species. The sites collected by Newell et al. (2001) were both small permanent spring systems significantly removed from the nearest other source of water, which would have been the Columbia River at a distance of 20 km. However, as these authors note, the terrain between their sites and the River is relatively flat with commonly occurring, significant winds and they postulate that many of the species they collected may have originated from the River or other more remote sites.

Protoptila coloma Ross, *Agraylea multipunctata* Curtis, *Hydroptila xera* Ross, *Ceraclea alagma* (Ross), *Nectopsyche lahontanensis* Haddock, *Oecetis cinerascens* (Hagen), and *Ylodes reuteri* (MacLachlan) are new records for Washington State. Both *C. alagma* and *O. cinerascens* appear to be significant western range extensions for these primarily eastern species. The most western records for *O. cinerascens* appear to be from the upper Saskatchewan River, not far from the upper Columbia drainage (Floyd 1995). *Ceraclea alagma* has been recorded from Lake County, Montana, in the upper Columbia River drainage (Resh 1976). Ross (1944) commented that *C. alagma* was very common in a fish hatchery and, perhaps hatchery transfers have introduced these eastern taxa across the Continental Divide. The remainder of the new records were expected from Washington given their known distribution in adjacent states.

The Wahluke and Saddle Mountain areas that we surveyed contain a more diverse assemblage of aquatic environments but do not contain natural springs. The geographic area of our survey was much larger than that of Newell et al. (2001). It may be that the larger, more habitat diverse area that we sampled (but its lack of a spring-based fauna) explains many of the differences between the two surveys. Additionally, both studies were relatively short in duration, ours only a single year and their study two years. If either or both studies had been longer in duration some of the rarely encountered species (e.g., *Hydroptila modica* Mosely, *Leucotrichia pictipes* (Banks), *Amiocentrus aspilus* (Ross), *Limnephilus abbreviatus* Banks, *L. sitchensis* (Kolenati), and *Stactobiella delira* (Ross)) may have been found during both studies and in larger numbers. Of note is the fact that the three most commonly collected species (*Ceratopsyche cockerelli* Banks, *Cheumatopsyche campyla* Ross, and *Hydropsyche californica* Banks) were the same in both studies.

Relative abundance figures are subjective, but we believe that they do present a good indication of captures during our studies based on our collecting techniques. One of the objectives of our study was to sample as many habitats as possible during the one year assigned to this study which meant that we had to sacrifice specificity. At least three different sites were collected weekly, the number varied from three to six depending on the number of traps and trappers available. Additionally, site selection was not consistent from week to week. Although we tried to collect every site that was established at least once every three weeks, some sites were more similar to others in relation to distance from a specific type of aquatic

Table 2. Comparison of caddisfly species collected on the Hanford Reach National Monument by Newell et al. (2001) and during this study.

Species collected in both Newell et al. (2001) and the current study	Species collected only by Newell et al. (2001)	Species collected only during the current study
Glossosomatidae	Brachycentridae	Glossosomatidae
Culoptila cantha (Ross)	*Amiocentrus aspilus* Ross	*Protopila columa* Ross
Glossoma velonum Ross	Hydropsychidae	Hydropsychidae
Protopila erotica Ross	*Parapsyche almota* Ross	*Cheumatopsyche analis* (Banks)
Hydropsychidae	Hydroptilidae	*Hydropsyche occidentalis* Banks
Ceratopsyche cockerelli Banks	*Hydroptila modica* Mosely	Hydroptilidae
Cheumatopsyche campyla Ross	*Leucotrichia pictipes* (Banks)	*Agraylea multipunctata* Curtis
Hydropsyche californica Banks	Limnephilidae	*Hydroptila ajax* Ross
Hydroptilidae	*Hesperophylax disignatus* (Walker)	*Hydroptila arctia* Ross
Hydroptila argosa Ross	*Limnephilus abbreviatus* Banks	*Hydroptila xera* Ross
Lepidostomatidae	*Limnephilus frijole* Ross	*Stactobiella delira* (Ross)
Lepidostoma cinereum (Banks)	*Limnephilus sitchensis* (Kolenati)	Leptoceridae
Leptoceridae		*Ceraclea alagma* (Ross)
Oecetis avara (Banks)		*Mystacides alafimbriata* Hill-Griffin
Oecetis immobilis (Hagen)		*Nectopsyche lahontanesis* Haddock
Oecetis inconspicua (Walker)		*Oecetis cinerascens* (Hagen)
Triaenodes tardus Milne		*Ylodes reuteri* (MacLachland)
Ylodes frontalis (Banks)		Limnephilidae
Limnephilidae		*Limnephilus acula* Ross & Merkley
Limnephilus assimilis (Banks)		Phryganeidae
Limnephilua spinatus Banks		*Phryganea cinerea* Walker
Psychomyiidae		Polycentropidae
Psychomyia flavida Hagen		*Polycentropus cinereus* (Hagen)
		Polycentropus flavus (Banks)

habitat (e.g., a canal) and some species may be over- or under-represented in our collections because of factors such as site selection, weather patterns during any given collection period, and the number of traps used, among others.

Acknowledgments

This work was supported by a grant from The Nature Conservancy of Washington State. We thank Jim Evans of TNC for his enthusiastic support and aid during this study. We also thank the staff of the United States Fish and Wildlife Service that maintains the Hanford National Monument for their generous assistance. Access to other areas of the Hanford Site, that are normally closed to the public, was provided through the assistance of Dana Ward of the United States Department of Energy.

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